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(54) COLOR PICTURE PROJECTING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a color picture projecting device by which a color picture whose color uniformity is excellent is projected by high illuminance.

SOLUTION: In the color picture projecting device having an information projecting light source formed of a non-self-light-emission type spatial modulating element and the separating means of the respective color light components such as red, green and blue of light emitted by a light source, a projecting light source is constituted of a main light source lamp consisting of a discharge lamp and a sub light source lamp to reinforce the red light component of the light emitted by the main light source lamp.

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CLAIMS

[Claim(s)]
[Claim 1] It is color image projection equipment characterized by to consist of a main light source lamp with which the light source concerned for projection consists of a discharge lamp in color image projection equipment with the light source of the information which forms by the nonself luminescence mold space modulation element for projection, and the separation means of the red of light who emanates from the light source concerned, green, and each blue colored-light component, and a sublight source lamp with which a part for red Mitsunari of the light which emits from the main light source lamp concerned reinforces.
[Claim 2] Color image projection equipment according to claim 1 characterized by compounding a part for red Mitsunari emitted from a sublight source lamp with the light from the main light source lamp before the incidence to a nonself luminescence mold space modulation element.
[Claim 3] Color image projection equipment according to claim 1 characterized by compounding a part for red Mitsunari emitted from a sublight source lamp with the light from the main light source lamp after the incidence to a nonself luminescence mold space modulation element.
[Claim 4] Color image projection equipment according to claim 1 to 3 characterized by adjusting the correlated color temperature of the light on which the synchrotron orbital radiation reinforcement is controlled and it is projected by this by changing one [at least] electrical input conditions of the main light source lamp and a sublight source lamp.
[Claim 5] Color image projection equipment according to claim 1 to 4 with which the discharge lamp which constitutes a sublight source lamp is characterized by enclosing a lithium at least as photogene.
[Claim 6] Color image projection equipment according to claim 1 to 4 with which the discharge lamp which constitutes a sublight source lamp is characterized by enclosing neon as photogene.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to color image projection equipment.

[0002]
[Description of the Prior Art] By using nonself luminescence mold space modulation elements, such as a liquid crystal panel and a minute mirror set component, the color image projection equipment which projects a color image for example, on a screen has spread widely. Drawing 16 is the explanatory view showing the configuration of conventional color image projection equipment. As for synthetic prism and 149, in this drawing, the interference filter integrator optical system, and whose 134 and 135 a light source lamp and 132 are [for 131] the separation means of a colored light component as for a reflector and 133, the nonself luminescence mold space modulation element (only henceforth a "modulation element") which in 136, 137, and 138 a mirror, and 139, 141, 142 and 143 become from a lens, and 145, 146, and 147 become for example, from a transparency mold liquid crystal panel, and 148 are [a projector lens and 150] screens.
[0003] The light which was emitted from the light source lamp 131 and condensed by the reflector 132 in this color image projection equipment After being homogenized and equalized by the integrator optical system 133, with an interference filter 134 The red light R which was divided into a part for red Mitsunari, and the green light component and blue glow component which are other colored light components, and penetrated the interference filter 134 concerned It is reflected by the mirror 136, and by penetrating a modulation element 145 through a lens 141, it becomes a red light figure and incidence is carried out to the synthetic prism 148. On the other hand, the light which is other colored light components reflected by the interference filter 134 is further separated into a green light component and a blue glow component by the interference filter 135, and by penetrating a modulation element 146 through a lens 142, the green light G reflected with the interference filter 135 concerned serves as a green light image, and carries out incidence to the synthetic prism 148. Moreover, a mirror 137 and after being reflected by the mirror 138 through a lens 139, by penetrating a modulation element 147 through a lens 143, the blue glow B which penetrated the interference filter 135 serves as a blue glow image, and carries out incidence to the synthetic prism 148. And by the synthetic prism 148, the red light R, green light G, and blue glow B are compounded, and a color image is projected on a screen 150 through a projector lens 149.
[0004] Conventionally, in the color image projection equipment of the above configurations, although the metal halide lamp, the short arc mold mercury lamp, etc. are used as a light source lamp In this metal halide lamp or a short arc mold mercury lamp Since it is small, when the reinforcement on the visibility for red Mitsunari in synchrotron orbital radiation projects the synchrotron orbital radiation concerned for example, on a screen as it was as compared with a green light component and a blue glow component, the color image projected on the screen concerned becomes what has the balance of a color weak red extent and low.
[0005] However, by the approach of controlling the reinforcement of a blue glow component and a green light component using a filter etc. on the basis of the reinforcement for red Mitsunari, the utilization factor of the light in color image projection equipment falls sharply, and even if the projected color image becomes that by which balance of a color was achieved, it has the problem that the illuminance on a screen will become low inevitably. Since the cost will become large-sized very highly, the discharge lamp with the large output which can obtain an illuminance big on the other hand enough was not realistic, and it was what does not suit needs called the miniaturization from a commercial scene, either.
[0006]
[Problem(s) to be Solved by the Invention] This invention is made based on the above situations, and the purpose is in offering the color image projection equipment which can project the high color image of the uniformity ratio of illuminance of a color with a high illuminance.
[0007]
[Means for Solving the Problem] In color image projection equipment with the separation means of the red of light who emits the color image projection equipment of this invention from the light source of the information formed by the nonself luminescence mold space modulation element for projection, and the

light source concerned, green, and each blue colored-light component, it is characterized by for the light source concerned for projection to consist of a main light source lamp which consists of a discharge lamp, and a sublight source lamp with which a part for red Mitsunari of the light which emits from the main light source lamp concerned reinforces.

[0008] The color image projection equipment of this invention can compound a part for red Mitsunari emitted from a sublight source lamp with the light from the main light source lamp, before the incidence to a nonself luminescence mold space modulation element. Moreover, a part for red Mitsunari emitted from a sublight source lamp may be compounded with the light from the main light source lamp after the incidence to a nonself luminescence mold space modulation element.

[0009] By changing one [at least] electrical input conditions of the main light source lamp and a sublight source lamp, the synchrotron orbital radiation reinforcement is controlled and the color image projection equipment of this invention is characterized by adjusting the correlated color temperature of the light on which it is projected by this.

[0010] In the color image projection equipment of this invention, the discharge lamp which constitutes a sublight source lamp had the lithium enclosed at least as photogene, and may enclose neon as photogene.

[0011]

[Function] The light source for projection concerned consists of a main light source lamp and a sublight source lamp in the light source used when the color image projection equipment of this invention projects the information formed of actuation of modification of whenever [on-off / of the liquid crystal panel of the modulation element concerned /, or angle-of-reflection / of a minute mirror] etc. by electrical signals, such as an image transmitted to the liquid crystal panel which is a nonself luminescence mold space modulation element, a minute mirror set component, etc. Since the synchrotron orbital radiation from the sublight source lamp with which a part for red Mitsunari in the synchrotron orbital radiation from the main light source lamp is reinforced is mixed according to said equipment, As a result of the relative intensity for red Mitsunari of the light projected becoming higher than the relative intensity for red Mitsunari in the light from the main light source lamp, in feeling of ** A part for red Mitsunari, The balance of a color with a green light component and a blue glow component becomes good, and the blue glow component and green light component in synchrotron orbital radiation from the main light source lamp are not greatly made into a sacrifice, consequently the high color image of the uniformity ratio of illuminance of a color can be projected with a high illuminance.

[0012]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail with reference to a drawing.

<Gestalt of the 1st operation> drawing 1 is the explanatory view showing the configuration of the color image projection equipment in the gestalt of operation of the 1st of this invention, and drawing 2 is the explanatory view showing the configuration of the light equipment of drawing 1 . In the color image projection equipment in drawing 1 , the light emitted from light equipment 10 The red light R which is separated into a part for red Mitsunari, and the green light component and blue glow component which are other colored light components by the interference filter 21, and penetrates the interference filter 21 concerned It is reflected by the mirror 25, and it becomes a red light figure by penetrating a modulation element 34 through a lens 31 after that, and incidence is respectively carried out to the synthetic prism 37 which four cylindrical triangular prism was combined and was constituted.

[0013] Moreover, the light reflected by the interference filter 21 is further separated into a green light component and a blue glow component by the interference filter 22, and the green light G reflected with the interference filter 22 concerned penetrates a modulation element 35 through a lens 32, serves as a green light image, and carries out incidence to the synthetic prism 37. And a mirror 26 and after being reflected by the mirror 27 through a lens 28, by penetrating a modulation element 36 through a lens 33, the blue glow B which penetrated the interference filter 22 serves as a blue glow image, and carries out

incidence to the synthetic prism 37. Thus, after the red light R, the green light G, and blue glow B which it was decomposed into each colored light component, and carried out incidence to the synthetic prism 37 are compounded, it is projected on them on a screen 39 with a projector lens 38.

[0014] The main light source lamp 11 which consists of a short arc mold discharge lamp with which the reflector 13 was formed in light equipment 10 as shown in drawing 2 , By the mirror 15 which is arranged so that the sublight source lamp 12 which consists of a short arc mold discharge lamp with which the reflector 14 was formed may counter, and has been arranged between the main light source lamp 11 concerned and the sublight source lamp 12 It considers as the configuration incidence of the synchrotron orbital radiation from the main light source lamp 11 concerned and the synchrotron orbital radiation from the sublight source lamp 12 is carried out [configuration] to incidence edge 17A of the rod integrator 17. And it is mixed by the rod integrator 17, is homogenized and equalized, and outgoing radiation of the light which was emitted from the main light source lamp 11, and was condensed by the reflector 13, and the light which was emitted from the sublight source lamp 12, and was condensed by the reflector 14 is carried out from outgoing radiation edge 17B of the rod integrator 17 concerned, and it is emitted through the lens 18 prepared in the way outside the outgoing radiation edge 17B concerned.

[0015] Especially as a discharge lamp used as a main light source lamp 11, it is not limited and a metal halide lamp, an extra-high pressure mercury lamp, a xenon lamp, etc. are mentioned.

[0016] On the other hand, as compared with the relative intensity for red Mitsunari in the light to which the relative intensity for red Mitsunari in the discharge lamp which raised a part for red Mitsunari, i.e., the light emitted, is emitted from the main light source lamp 11, a high thing is used that a part for red Mitsunari in the synchrotron orbital radiation from the main light source lamp 11 should be reinforced as a sublight source lamp 12. About the concrete example of the sublight source lamp 12, it mentions later. "The relative intensity for red Mitsunari" means the reinforcement for red Mitsunari to total radiation light here.

[0017] As [both] reflectors 13 and 14, the ellipsoid-of-revolution mirror is used, each 1st focus of the main light source lamp 11 and the sublight source lamp 12 is located in the discharge container of a short arc mold discharge lamp, and each 2nd focus is located in incidence edge 17A of the rod integrator 17.

[0018] It is the optical device for photomixings which mixes the synchrotron orbital radiation from the main light source lamp 11, and the synchrotron orbital radiation from the sublight source lamp 12, and the rod integrator 17 consists of a rectangle column-like glass rod, and it is desirable that the profile configuration of outgoing radiation edge 17B is similarity at the configuration of a screen 39. Moreover, the configuration of incidence edge 17A of the rod integrator 17 is made on parenchyma the same as that of the configuration of outgoing radiation edge 17B. A lens 18 is a lens used since a mixed light by which outgoing radiation was carried out from outgoing radiation edge 17B of the rod integrator 17 is certainly irradiated on each modulation elements 34 and 35 and 36.

[0019] Interference filters 21 and 22 are the separation means of each colored light component of light, and, specifically, can use a dichroic mirror etc. above. Moreover, as for modulation elements 34, 35, and 36, corresponding to the red light R, green light G, and blue glow B, a transparency mold liquid crystal panel etc. is used, respectively. Moreover, when using reflective mold modulation elements, such as a reflective mold liquid crystal panel and a digital mirror device (DMD), it can consider as the configuration according to it. Modulation elements 34, 35, and 36 are controlled synchronizing with the color image to project.

[0020] The configuration of the projection equipment concerned at the time of using reflective mold modulation elements, such as a reflective mold liquid crystal panel and a digital mirror device (DMD), as a modulation element is shown in drawing 14 . It is condensed with a lens 28, and incidence of the red light R which the light emitted from light equipment 10 is separated into a part for red Mitsunari, and the green light component and blue glow component which are other colored light components by the interference filter 21, and penetrates the interference filter 21 concerned is carried out to the reflective

mold modulation elements 30, such as DMD, and it carries out incidence of the red light R reflected from the modulation element 30 concerned to the synthetic prism 37. It is separated by the interference filter 22, and it is condensed with a lens 28, and incidence of the green light component and blue glow component which reflected the interference filter 21 is carried out to the reflective mold modulation elements 30, such as DMD, and they carry out incidence of the green light component through a mirror 26 to the synthetic prism 37. Incidence of the blue glow component is carried out to the synthetic prism 37 like the red light R through a mirror 27. Each colored light component is compounded by the synthetic prism 37, and is projected on a screen 39 through a projector lens 38.

[0021] The projection equipment which used only one reflective mold modulation elements 30, such as the above mentioned DMD, is shown in drawing 15 . Color division is carried out in time with the filter 41 which performs colored light component division by rotation through a lens 28, each colored light component is reflected by the reflective mold modulation element 30, and it is projected on the light emitted from light equipment 10 on a screen 39 from a projector lens 38 through a mirror 26. Since rotation of said filter 41 is very high-speed, the color image which is equal in feeling of ** is obtained.

[0022] The synthetic prism 37 is the synthetic means of each colored light component constituted with a dichroic mirror etc.

[0023] According to the color image projection equipment of the above configuration, the light emitted to the synchrotron orbital radiation from the main light source lamp 11 from the sublight source lamp 12 is mixed by the rod integrator 17, but In order that the synchrotron orbital radiation from the sublight source lamp 12 may raise a part for red Mitsunari, The relative intensity for red Mitsunari of the light projected becomes higher than the relative intensity for red Mitsunari in the synchrotron orbital radiation in the case of main light source lamp 11 independent one, and the balance of the color of a part for red Mitsunari, and a green light component and a blue glow component becomes good in feeling of **. Consequently, the color image which has the uniformity ratio of illuminance of a high color can be projected with a high illuminance on a screen 39, without making greatly the blue glow component and green light component in synchrotron orbital radiation from the main light source lamp 11 and the sublight source lamp 12 into a sacrifice.

[0024] <Gestalt of the 2nd operation> drawing 3 is the explanatory view showing the configuration of the light equipment of the color image projection equipment in the gestalt of operation of the 2nd of this invention. In the example of this drawing, it has the same configuration as the color image projection equipment in the gestalt of the 1st operation shown in drawing 1 except the configuration of light equipment.

[0025] As the light equipment 40 of this example is shown in drawing 3 , it comes to have the main light source lamp 11 which consists of a short arc mold discharge lamp with which the reflector 13 was formed, and the sublight source lamp 12 which consists of a short arc mold discharge lamp with which the reflector 14 was formed, and incidence of the synchrotron orbital radiation from the main light source lamp 11 concerned and the synchrotron orbital radiation from the sublight source lamp 12 is carried out at the include angle of 60 degrees C as opposed to the prism array plate 45 which consists of two or more prism. And the light which passed the prism array plate 45 consists of two or more lens elements, is led to the integrator optical system 46 which has two lens array plates 46A and 46B estranged and arranged, and it is homogenized and equalized by the integrator optical system 46 concerned, and it is emitted through the polarization demarcation membrane 48 and a lens 49 according to it.

[0026] The thing same as the main light source lamp 11 and a sublight source lamp 12 as the gestalt of the 1st operation is used. The integrator optical system 46 is an optical device for photomixings, generally two lens array plates 46A and 46B concerning the INTE crater optical system 46 concerned have a similar configuration, and the focal distance of each lens element is also an equal. Moreover, the polarization demarcation membrane 48 is formed in order to use the synchrotron orbital radiation from the main light source lamp 11 and the sublight source lamp 12 at high effectiveness, and since the light

which carries out outgoing radiation from the integrator optical system 46 is condensed on each modulation element, the lens 49 is formed.

[0027] Like the color image projection equipment in the gestalt of the 1st operation, with an interference filter, finally it is decomposed into red light, green light, and blue glow, and each colored light carries out incidence of the mixed light emitted from light equipment 40 to synthetic prism. And the red light, green light, and blue glow which carried out incidence to synthetic prism are compounded, and it is projected on a screen with a projector lens.

[0028] According to the color image projection equipment of the above configuration, the same operation effectiveness as the color image projection equipment of the gestalt of the 1st operation is acquired.

[0029] <Gestalt of the 3rd operation> drawing 4 is the explanatory view showing the configuration of the light equipment of the color image projection equipment in the gestalt of operation of the 3rd of this invention. In the example of this drawing, it has the same configuration as the color image projection equipment in the gestalt of the 1st operation shown in drawing 1 except the configuration of light equipment.

[0030] The main light source lamp 11 which consists of a short arc mold discharge lamp with which the reflector 13 was formed as the light equipment 50 of this example is shown in drawing 4 , The optical axis is arranged in the direction almost perpendicular to the optical axis of the main light source lamp 11 concerned, and it comes to have the sublight source lamp 12 which consists of a short arc mold discharge lamp with which the reflector 14 was formed. The synchrotron orbital radiation from the main light source lamp 11, The synchrotron orbital radiation from the sublight source lamp 12 reflects a part for red Mitsunari, and is led to the interference filter 51 which penetrates the blue glow component and green light component which are other colored light components. And the integrator optical system 46 is mixed, it is homogenized and equalized and the blue glow B1 and green light G1 which penetrated the interference filter 51 among the synchrotron orbital radiation from the main light source lamp 11, and the red light R2 reflected with the interference filter 51 among the synchrotron orbital radiation from the sublight source lamp 12 are emitted.

[0031] The thing same as the main light source lamp 11 and a sublight source lamp 12 as the gestalt of the 1st operation is used. The integrator optical system 46 has the same configuration as the thing of the color image projection equipment in the gestalt of the 2nd operation.

[0032] Like the color image projection equipment in the gestalt of the 1st operation, with an interference filter, finally it is decomposed into red light, green light, and blue glow, and each colored light carries out incidence of the mixed light emitted from light equipment 50 to synthetic prism. And the red light, green light, and blue glow which carried out incidence to synthetic prism are compounded, and it is projected on a screen with a projector lens.

[0033] In this color image projection equipment, blue glow B-2 and green light G2 which the red light R1 reflected by the interference filter 51 among the synchrotron orbital radiation from the main light source lamp 11 was not used, and penetrated the interference filter 51 among the synchrotron orbital radiation from the sublight source lamp 12 are not used, either.

[0034] According to the color image projection equipment of the above configuration, the same operation effectiveness as the color image projection equipment of the gestalt of the 1st operation is acquired.

[0035] Moreover, since only a part for red Mitsunari is compoundable among the synchrotron orbital radiation from the sublight source lamp 12 to the synchrotron orbital radiation from the main light source lamp 11 in this color image projection equipment, By enlarging optical reinforcement of the synchrotron orbital radiation from the sublight source lamp 12 concerned, only the relative intensity for red Mitsunari of a mixed light can be increased certainly, and, thereby, the correlated color temperature of the light projected can be adjusted easily.

[0036] <Gestalt of the 4th operation> drawing 5 is the explanatory view showing the configuration of the

color image projection equipment in the gestalt of operation of the 4th of this invention. In the color image projection equipment of this example, it has the 1st light source device equipped with the main light source lamp 11 and the integrator optical system 61 which light equipment becomes from a short arc mold discharge lamp, and the 2nd light source device equipped with the sublight source lamp 12 and the integrator optical system 62 which it becomes from a short arc mold discharge lamp, and the synchrotron orbital radiation concerning the main light source lamp 11 and the synchrotron orbital radiation concerning the sublight source lamp 12 are emitted according to an individual.

[0037] The light of the synchrotron orbital radiation from the main light source lamp 11 with which the reflector 13 was formed specifically After being homogenized and equalized by the integrator optical system 61, with an interference filter 64 The blue glow B1 which was divided into the blue glow component, and a part for red Mitsunari and the green light component which are other colored light components, and was reflected by this interference filter 64 After being reflected by the mirror 68, by penetrating a modulation element 36 through a lens 33, it becomes a blue glow image and four cylindrical triangular prism carries out incidence to the synthetic prism 37 combined and constituted respectively. Moreover, the light which penetrated the interference filter 64 is further separated into a part for a green light component and red Mitsunari by the interference filter 65, and by penetrating a modulation element 35 through a lens 32, the green light G1 reflected by this interference filter 65 serves as a green light image, and carries out incidence to the synthetic prism 37.

[0038] On the other hand, the synchrotron orbital radiation from the sublight source lamp 12 with which the reflector 14 was formed After being homogenized and equalized by the integrator optical system 62, with an interference filter 66 Separating into a part for red Mitsunari, and the green light component and blue glow component which are other colored light components, by penetrating a modulation element 34 through a lens 31, the red light R2 reflected by this interference filter 66 serves as a red light figure, and carries out incidence to the synthetic prism 37. And each of the red light R2 which was decomposed into each colored light component and penetrated modulation elements 34, 35, and 36, green light G1, and blue glow B1 is compounded by the synthetic prism 37, and is projected on this synthetic light on a screen 39 with a projector lens 38.

[0039] Let configuration members, such as the main light source lamp 11 and the sublight source lamp 12, modulation elements 34, 35, and 36, and interference filters 64, 65, and 66, be the same things as the color image projection equipment in the gestalt of the 1st operation in this color image projection equipment, for example.

[0040] In this color image projection equipment, the main light source lamp 11 concerning the 1st light source device which constitutes light equipment, and the sublight source lamp 12 concerning the 2nd light source device are turned on and used for coincidence. Moreover, among the synchrotron orbital radiation from the main light source lamp 11, the red light R1 is not used and green light G2 and blue glow B-2 are not used among the synchrotron orbital radiation from the sublight source lamp 12, either.

[0041] According to the color image projection equipment of the above configuration, with the synthetic prism 37 Although the red light R2 which was emitted to the green light G1 and blue glow B1 which were emitted from the main light source lamp 11 concerning the 1st light source device, and passed modulation elements 35 and 36 respectively from the sublight source lamp 12 concerning the 2nd light source device, and passed the modulation element 34 is compounded Since the synchrotron orbital radiation from the sublight source lamp 12 is controlled independently of the main light source lamp 11 and can adjust the reinforcement for red Mitsunari, it becomes good in feeling of ** balancing [of the color of a part for red Mitsunari, and a green light component and a blue glow component] it. Consequently, the color image which has the uniformity ratio of illuminance of a high color can be projected with a high illuminance on a screen 39, without making greatly the blue glow component and green light component in synchrotron orbital radiation from the main light source lamp 11 into a sacrifice.

[0042] Moreover, in this color image projection equipment, since only the relative intensity for red Mitsunari of a synthetic light can be certainly increased by enlarging optical reinforcement of the

synchrotron orbital radiation from the sublight source lamp 12 concerned in order to compound only a part for red Mitsunari among the synchrotron orbital radiation from the sublight source lamp 12 to the synchrotron orbital radiation from the main light source lamp 11, the correlated color temperature of a synthetic light can be adjusted easily.

[0043] <Gestalt of the 5th operation> drawing 6 is the explanatory view showing the configuration of the color image projection equipment in the gestalt of operation of the 5th of this invention. The 1st light source device equipped with the main light source lamp 11 and the integrator optical system 71 which light equipment becomes from a short arc mold discharge lamp in the color image projection equipment of this example, The synchrotron orbital radiation which has the 2nd light source device equipped with the sublight source lamp 12 and the integrator optical system 72 which consist of a short arc mold discharge lamp, and starts the main light source lamp 11, While the synchrotron orbital radiation concerning the sublight source lamp 12 is emitted according to an individual, it is projected on the synchrotron orbital radiation from the main light source lamp 11 and the sublight source lamp 12 which were disassembled into each colored light component on a screen 39 in the condition of having been compounded.

[0044] The light specifically emitted from the main light source lamp 11 with which the reflector 13 was formed After being homogenized and equalized by the integrator optical system 71, with an interference filter 74 It separates into a part for red Mitsunari, and the blue glow component and green light component which are other colored light components, and by penetrating a modulation element 85 through a lens 81, the blue glow B1 which penetrated the interference filter 74 concerned serves as a blue glow image, and it is projected on it with a projector lens 91. Moreover, the light reflected by the interference filter 74 is further separated into a part for a green light component and red Mitsunari by the interference filter 75, and by penetrating a modulation element 86 through a lens 82, the green light G1 reflected with the interference filter 75 concerned serves as a green light image, and it is projected on it with a projector lens 92. And after reflecting by the mirror 78, by penetrating a modulation element 87 through a lens 83, the red light R1 which penetrated the interference filter 75 serves as a red light figure, and it is projected on it with a projector lens 93.

[0045] On the other hand, the synchrotron orbital radiation from the sublight source lamp 12 with which the reflector 14 was formed After being homogenized and equalized by the integrator optical system 72, with an interference filter 76 It separates into a part for red Mitsunari, and the green light component and blue glow component which are other colored light components, and by penetrating a modulation element 88 through a lens 84, the red light R2 which penetrated the interference filter 76 concerned serves as a red light figure, and it is projected on it with a projector lens 94. And the light figure of each color on which it was projected with projector lenses 91, 92, 93, and 94 and which consists of blue glow B1, green light G1, red light R1, and red light R2 respectively is projected on a screen 39 in the condition of having been compounded.

[0046] Let configuration members, such as the main light source lamp 11, modulation elements 85, 86, 87, and 88, and interference filters 74, 75, and 76, be the same things as the color image projection equipment in the gestalt of the 4th operation in this color image projection equipment, for example. moreover, especially as a sublight source lamp 12, it is not limited, and the same thing as the gestalt of the 1st operation can be used, for example, things are also made.

[0047] In this color image projection equipment, the main light source lamp 11 concerning the 1st light source device and the sublight source lamp 12 concerning the 2nd light source device are turned on and used for coincidence. Moreover, the green light G2 and blue glow B-2 which are obtained from the synchrotron orbital radiation from the sublight source lamp 12 are not used.

[0048] According to the color image projection equipment of the above configuration, the red light R2 which was emitted to each colored light which was emitted from the main light source lamp 11, and passed modulation elements 85, 86, and 87 respectively like the color image projection equipment of the gestalt of the 4th operation from the sublight source lamp 12, and passed the modulation element 88 is

compounded, and get, but In the light on which it is projected since the amount of [of the light obtained] red Mitsunari consists of a part for red Mitsunari concerning the synchrotron orbital radiation of a part for red Mitsunari concerning the synchrotron orbital radiation of the main light source lamp 11, and the sublight source lamp 12 The relative intensity for red Mitsunari becomes higher than a case independent [main light source lamp 11], and the color of a part for red Mitsunari, and a green light component and a blue glow component becomes good in feeling of **. Consequently, the color image which has the uniformity ratio of illuminance of a high color can be projected with a high illuminance on a screen 39, without making greatly the blue glow component and green light component in synchrotron orbital radiation from the main light source lamp 11 into a sacrifice.

[0049] Moreover, since only a part for red Mitsunari is compoundable among the synchrotron orbital radiation from the sublight source lamp 12 to the synchrotron orbital radiation from the main light source lamp 11 in this color image projection equipment, By enlarging optical reinforcement of the synchrotron orbital radiation from the sublight source lamp 12 concerned, only the relative intensity for red Mitsunari of the light obtained certainly can be increased, and, thereby, the correlated color temperature of the light on which it is projected can be adjusted easily.

[0050] <Sublight source lamp> drawing 7 is the sectional view for explanation showing the 1st example of the short arc mold discharge lamp used as a sublight source lamp of the color image projection equipment of this invention. this short arc mold discharge lamp — a metal halide lamp — it is — a circle — the electrode 104 is arranged so that it may come to have the discharge container 100 made from quartz glass which consists of a spherical light-emitting part 101 and the closure section 102 of the shape of a straight pipe extended to the method of the outside of the direction of a tube axis following those both ends and may counter mutually in the discharge container 100. The end face section of the internal lead rod 105 made from a tungsten which has an electrode 104 at a tip has been arranged at each closure section 102, for example, is electrically connected by being welded to the end section of the metallic foil 106 which consists of molybdenum. Moreover, the end face section of the external lead rod 108 which projects in the method of outside is welded to the other end of a metallic foil 106, and it connects with it electrically. In this discharge container 100, it is 3 volume of 1cm. The rare gas of 7kPa-65kPa is enclosed in the lithium halide of 1micro mol [of hits] - 100micromol, the mercury of an amount with which vapor pressure serves as 2MPa-10MPa, and ordinary temperature. Moreover, iodine, a bromine, chlorine, etc. are used as a halogen. As rare gas, although at least one sort in an argon, a krypton, and a xenon is used, it is desirable that an argon is used economically.

[0051] In the short arc mold discharge lamp of this configuration, since the lithium which is red photogene is the proper amount of enclosure, the relative intensity for sufficient red Mitsunari is obtained.

[0052] Drawing 8 is the sectional view for explanation showing the 2nd example of the short arc mold discharge lamp used as a sublight source lamp of the color image projection equipment of this invention. The electrode 114 is arranged so that this short arc mold discharge lamp may come to have the discharge container 110 which consists of the closure section 113 made from an alumina ceramic which has the outer diameter which suited the bore of the through tube of the light-emitting part 111 of the shape of a cylinder made from sapphire, the ring-like member 112 made from an alumina ceramic which has the outer diameter which suited the bore of this light-emitting part 111, and this ring-like member 112 and it may counter mutually in the discharge container 110. The electrode 116 made from a tungsten which has an electrode 114 at a tip penetrates the sealing glass section 115 prepared in each closure section 113, and is supplying electric power from the exterior. In the discharge container 110, in 1-20mg and ordinary temperature, the rare gas of 4kPa-65kPa is enclosed and the mercury which lithium-amalgam etc. is enclosed, for example, contains 85-mol % of a lithium is. As rare gas, at least one sort in neon, an argon, a krypton, and a xenon is enclosed, and in order to obtain good luminescence of the lithium which is red photogene, a xenon and a krypton are used preferably.

[0053] In the short arc mold discharge lamp of this configuration, in order that the lithium which is red

photogene may fully carry out red luminescence, being able to use vapor pressure of the enclosure object in a lighting condition as 4 or more kPas, the reinforcement for sufficient red Mitsunari for the light emitted is obtained. Moreover, since the quality of the materials of the discharge container 110 are sapphire and an alumina ceramic, the high pressure resistance at the time of lighting can be taken.

[0054] Drawing 9 is the sectional view for explanation showing the 3rd example of the short arc mold discharge lamp used as a sublight source lamp of the color image projection equipment of this invention. This short arc mold discharge lamp comes to have the discharge container 120 which consists of a metal member 122 of the shape of a column established following the light-emitting part 127 surrounded by the window part 123 made from plate-like sapphire prepared so that the reflecting mirror 121 which has an ellipse-like concave surface and opening of a concave surface made from an alumina ceramic might be plugged up, and said reflecting mirror 121. In the discharge container 120 concerned, it is arranged at the metal member 122 and the tip of the anode plate 125 extended holding the airtight of a light-emitting part 127 and the cathode 126 in the condition of having been supported by the supporter material 128 so that it might counter with this are arranged. Moreover, the neon of 0.8 or more MPas is enclosed with the inside of the discharge container 120 in ordinary temperature.

[0055] In the short arc mold discharge lamp of this configuration, by considering as the lighting condition of 30 or more atmospheric pressures, red luminescence of the enclosed neon can be carried out efficiently, and, thereby, the relative intensity for sufficient red Mitsunari is obtained.

[0056] As mentioned above, although the gestalt of operation of this invention was explained concretely, this invention is not limited to the above-mentioned example, and can add various modification about the concrete configuration of each part. For example, as a reflector used for the light equipment which arranges said lamp, rotation ****** other than an ellipsoid-of-revolution mirror can also be used.

[0057] the configuration shown in <example 1 of experiment> drawing 7 — following — a light-emitting part with a bore [of 8mm], and an outer diameter of 10.5mm — having — the volume — 0.35cm3 it is — the short arc mold discharge lamp which enclosed 1mg (volume of 1cm 3 per 1micromol) of lithium iodides, 14mg (vapor pressure is 3.2MPa(s)) of mercury, and argon gas in the discharge container so that it might be set to 40kPa(s) in ordinary temperature was produced. ********** which shows this short arc mold discharge lamp to drawing 10 when the light is switched on by input power 150W using 400Hz square wave AC power supply was able to be obtained. Powerful luminescence by the lithium is shown in the field with a wavelength [of 610nm], and a wavelength of 660nm - 700nm, and it is clear from this drawing that it is that in which the light of the produced short arc mold discharge lamp has the relative intensity for sufficient red Mitsunari.

[0058] the light-emitting part 8.5mm and whose overall length 7mm and an outer diameter are 13mm according to the configuration of <example 2 of experiment> drawing 8 for a bore — having — the volume — 0.25cm3 it is — the short arc mold discharge lamp which enclosed amalgam (lithium amalgam) 3mg containing 85-mol % of a lithium and a xenon in the discharge container so that it might be set to 13kPa(s) in ordinary temperature was produced. The spectral energy distribution which showed this short arc mold discharge lamp to drawing 10 when the light was switched on by the input power of 100W, and the same spectral energy distribution were obtained. Therefore, it is clear that it is that in which the light of the produced short arc mold discharge lamp has the relative intensity for sufficient red Mitsunari.

[0059] the configuration of <example 3 of experiment> drawing 9 — following — an outer diameter — 33mm and an overall length — 20mm and the volume — about 8 — cm3 it is — the short arc mold discharge lamp which enclosed neon in the discharge container so that it might be set to 2.5MPa(s) in ordinary temperature was produced. The spectral energy distribution which show this short arc mold discharge lamp to drawing 11 when the light is switched on by direct-current input power 120W were obtained. Powerful luminescence by neon is shown in the field with a wavelength of 600nm - 700nm, and it is clear from this drawing that it is that in which the light of the produced short arc mold discharge lamp has the relative intensity for sufficient red Mitsunari.

[0060]

[Example] Hereafter, the concrete example of this invention is explained.
According to the configuration of <example 1> drawing 1 , the color image projection equipment using the short arc mold discharge lamp of the specification shown with the mercury of an amount with which vapor pressure serves as 3.2MPa(s) as a sublight source lamp as a main light source lamp according to the configuration of drawing 7 , using the extra-high voltage short arc mold discharge lamp of the specification shown in Table 1 in Table 1 where the argon of 40kPa(s) is enclosed in ordinary temperature was produced. Moreover, the glass rod whose configuration of the incidence edge containing a methylene iodide and an outgoing radiation edge is 10mmx10mm as a rod integrator was used.
[0061]
[Table 1]

	発光物質		点灯電力 (W)
主光源ランプ	水銀	110mg／cm³	230
副光源ランプ	沃化リチウム	2．1×10⁻⁵mol／cm³	150

[0062] When the light on which it is projected from the produced color image projection equipment was measured, the spectrum shown in drawing 12 was obtained. In drawing 12 , the spectrum of luminescence by the lithium is added to a field with a wavelength of 610nm - 670nm, it gets down to it, and it is shown that the relative intensity for sufficient red Mitsunari is obtained. Moreover, when the color image was projected on the screen, the high color image of the uniformity ratio of illuminance of a color was able to be projected with the high illuminance.
[0063] As a <example 2> secondary light source lamp, it has the configuration of drawing 9 and color image projection equipment was produced like the example 1 except having used the short arc mold discharge lamp of the specification shown in Table 2.
[0064]
[Table 2]

	発光物質		点灯電力 (W)
主光源ランプ	水銀	110mg／cm³	230
副光源ランプ	ネオン	4．5MPa	120

[0065] When the light on which it is projected from the produced color image projection equipment was measured, the spectrum shown in drawing 13 was obtained. In drawing 13 , the spectrum of luminescence by neon is added to a field with a wavelength of 610nm - 700nm, it gets down to it, and it is shown that the relative intensity for sufficient red Mitsunari is obtained. Moreover, when the color image was projected on the screen, the high color image of the uniformity ratio of illuminance of a color was able to be projected with the high illuminance.
[0066]
[Effect of the Invention] The light source for projection concerned consists of a main light source lamp and a sublight source lamp in the light source used when the color image projection equipment of this invention projects the information formed of actuation of modification of whenever [on-off / of the liquid crystal panel of the modulation element concerned /, or angle-of-reflection / of a minute mirror] etc. by electrical signals, such as an image transmitted to the liquid crystal panel which is a nonself luminescence mold space modulation element, a minute mirror set component, etc. Since the synchrotron orbital radiation from the sublight source lamp with which a part for red Mitsunari in the

synchrotron orbital radiation from the main light source lamp is reinforced is mixed according to said equipment, The relative intensity for red Mitsunari of the light projected becomes higher than a main light source lamp independent case. In feeling of ** A part for red Mitsunari, The balance of a color with a green light component and a blue glow component becomes good, and the blue glow component and green light component in synchrotron orbital radiation from the main light source lamp are not greatly made into a sacrifice, consequently the high color image of the uniformity ratio of illuminance of a color can be projected with a high illuminance.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the explanatory view showing the color image projection equipment in the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the explanatory view showing the light equipment of the color image projection equipment of drawing 1 .
[Drawing 3] It is the explanatory view showing the light equipment of the color image projection equipment in the gestalt of operation of the 2nd of this invention.
[Drawing 4] It is the explanatory view showing the light equipment of the color image projection equipment in the gestalt of operation of the 3rd of this invention.
[Drawing 5] It is the explanatory view showing the color image projection equipment in the gestalt of operation of the 4th of this invention.
[Drawing 6] It is the explanatory view showing the color image projection equipment in the gestalt of operation of the 5th of this invention.
[Drawing 7] It is the sectional view for explanation showing an example of the short arc mold discharge lamp used as a sublight source lamp of the color image projection equipment of this invention.
[Drawing 8] It is the sectional view for explanation showing other examples of the short arc mold discharge lamp used as a sublight source lamp of the color image projection equipment of this invention.
[Drawing 9] It is a sectional view for explanation about the example of further others which shows the short arc mold discharge lamp used as a sublight source lamp of the color image projection equipment of this invention.
[Drawing 10] It is drawing showing the spectral characteristic of the sublight source lamp concerning the color image projection equipment of this invention.
[Drawing 11] It is drawing showing the spectral characteristic of other sublight source lamps concerning the color image projection equipment of this invention.
[Drawing 12] It is drawing showing the spectrum of the light on which it was projected from the color image projection equipment of this invention.
[Drawing 13] It is drawing showing the spectrum of the light on which it was projected from other color image projection equipments of this invention.
[Drawing 14] It is the explanatory view showing an example of the color image projection equipment of this invention using a reflective mold modulation element.
[Drawing 15] It is the explanatory view showing other examples of the color image projection equipment of this invention using a reflective mold modulation element.
[Drawing 16] It is the explanatory view showing conventional color image projection equipment.

[Description of Notations]
10, 40, 50 Light equipment
11 The Main Light Source Lamp
12 SubLight Source Lamp
13 14 Reflector
15, 25, 26, 27, 68, 78 Mirror
17 Rod Integrator
17A Incidence edge
17B Outgoing radiation edge
18, 28, 31, 32, 33, 49, 81, 82, 83, 84 Lens
21, 22, 51, 64, 65, 66, 74, 75, 76 Interference filter
30 Reflective Mold Modulation Element
34, 35, 36, 85, 86, 87, 88 Nonself luminescence mold space modulation element
37 Synthetic Prism
38, 91, 92, 93, 94 Projector lens
39 Screen
41 Filter
45 Prism Array Plate
46A, 46B Lens array plate
46, 61, 62, 71, 72 Integrator optical system
48 Polarization Demarcation Membrane
100, 110, 120 Discharge container
101, 111, 127 Light-emitting part
102 113 Closure section
104 114 Electrode
105 Internal Lead Rod
106 Metallic Foil
108 External Lead Rod
112 ring-like member
115 Sealing Glass Section
116 Electrode
121 Reflecting Mirror
122 Metal Member
123 Window Part
125 Anode Plate
126 Cathode
128 Supporter Material
131 Light Source Lamp
132 Reflector
133 Integrator Optical System
134 135 Interference filter
136, 137, 138 Mirror
139, 141, 142, 143 Lens
145, 146, 147 Nonself luminescence mold space modulation element
148 Synthetic Prism
149 Projector Lens
150 Screen

[Translation done.]